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(54) **PERIPHERAL COMPONENT INTERCONNECT RISER CAGE FASTENER**

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G06F 1/18 (2006.01)
H05K 7/14 (2006.01)

(52) **U.S. Cl.**
CPC ***G06F 1/186*** (2013.01); ***H05K 7/1429*** (2013.01); *F16B 21/04* (2013.01); *Y10T 29/49947* (2013.01)

(58) **Field of Classification Search**
USPC 411/339, 549, 559, 552–555, 409
See application file for complete search history.

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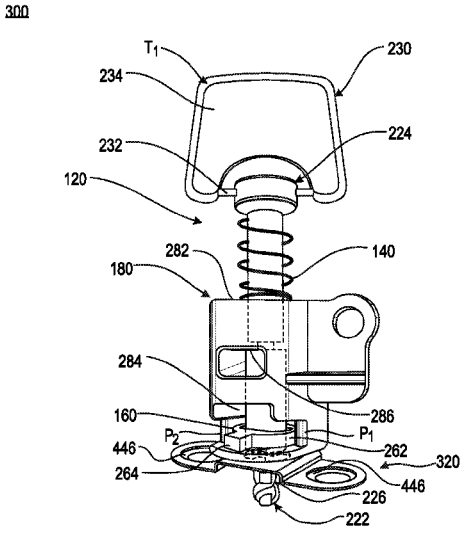
(57) **ABSTRACT**

A fastener useable with a peripheral component interconnect riser cage is provided herein. The fastener includes a body, a rotation limiter, and a housing. The body includes an engagement end that engages with a receptacle on a sub-pan and a cap end that positions the body. The rotation limiter includes a receiving member and a positioning member. The receiving member couples with the body. The positioning member extends from the rotation limiter to limit rotation of the body coupled thereto. The housing receives the rotation limiter and the body. The housing includes a rotation aperture that receives a positioning member such that the rotation limiter is rotatable along the rotation aperture. The housing further includes a lateral aperture to receive the body such that the body is inserted through the lateral aperture and coupled to the rotation limiter.

20 Claims, 11 Drawing Sheets



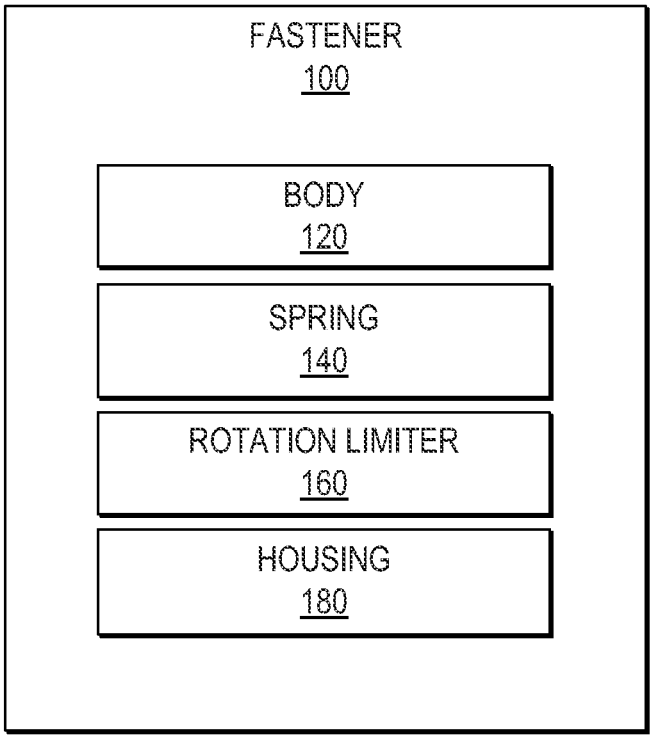

FASTENER
100
BODY
120
SPRING
140
ROTATION LIMITER
160
HOUSING
180

Fig. 1

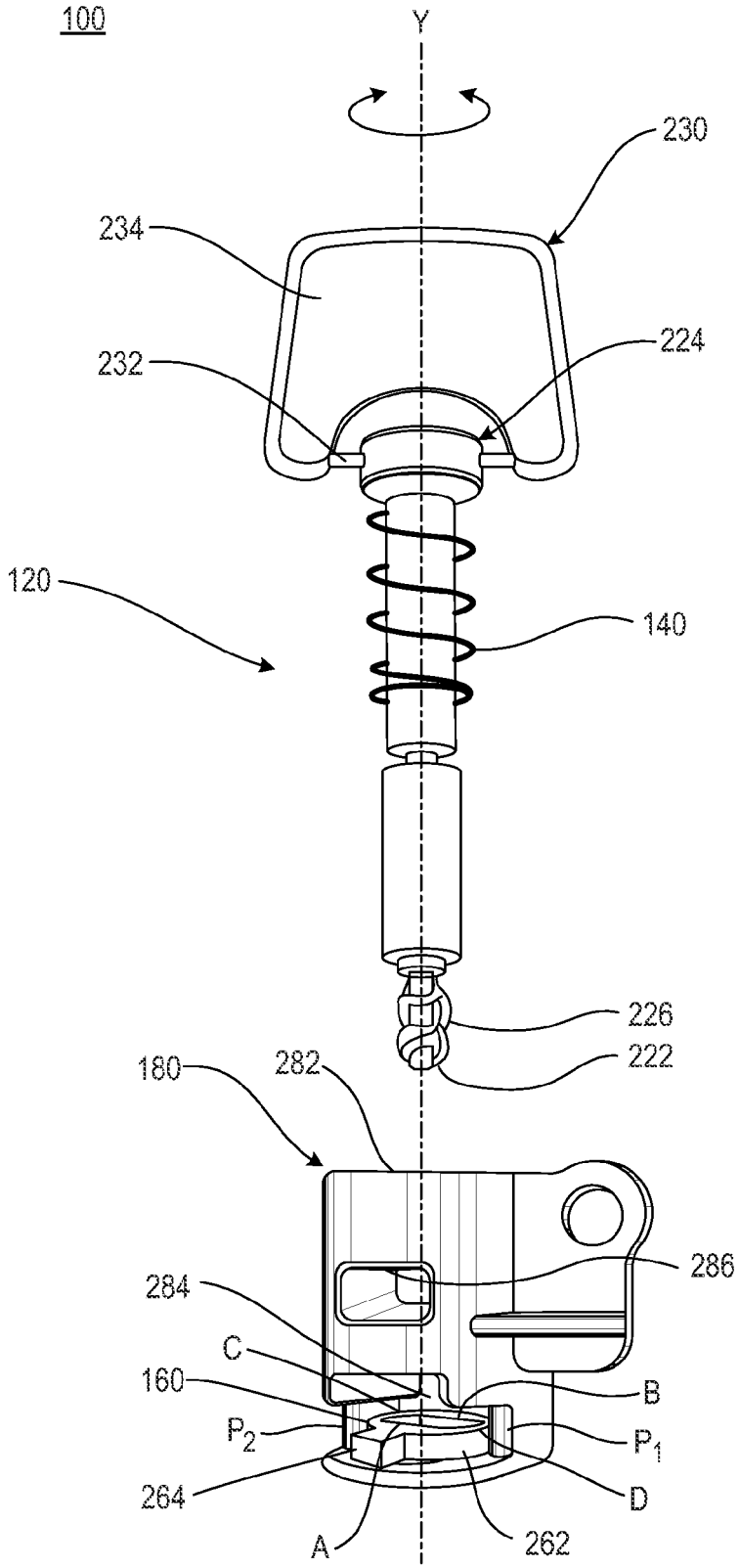

100
Y
230
234
232
224
120
140
226
222
180
282
286
284
C
160
B
P_2
P_1
264
D
A
262

Fig. 2

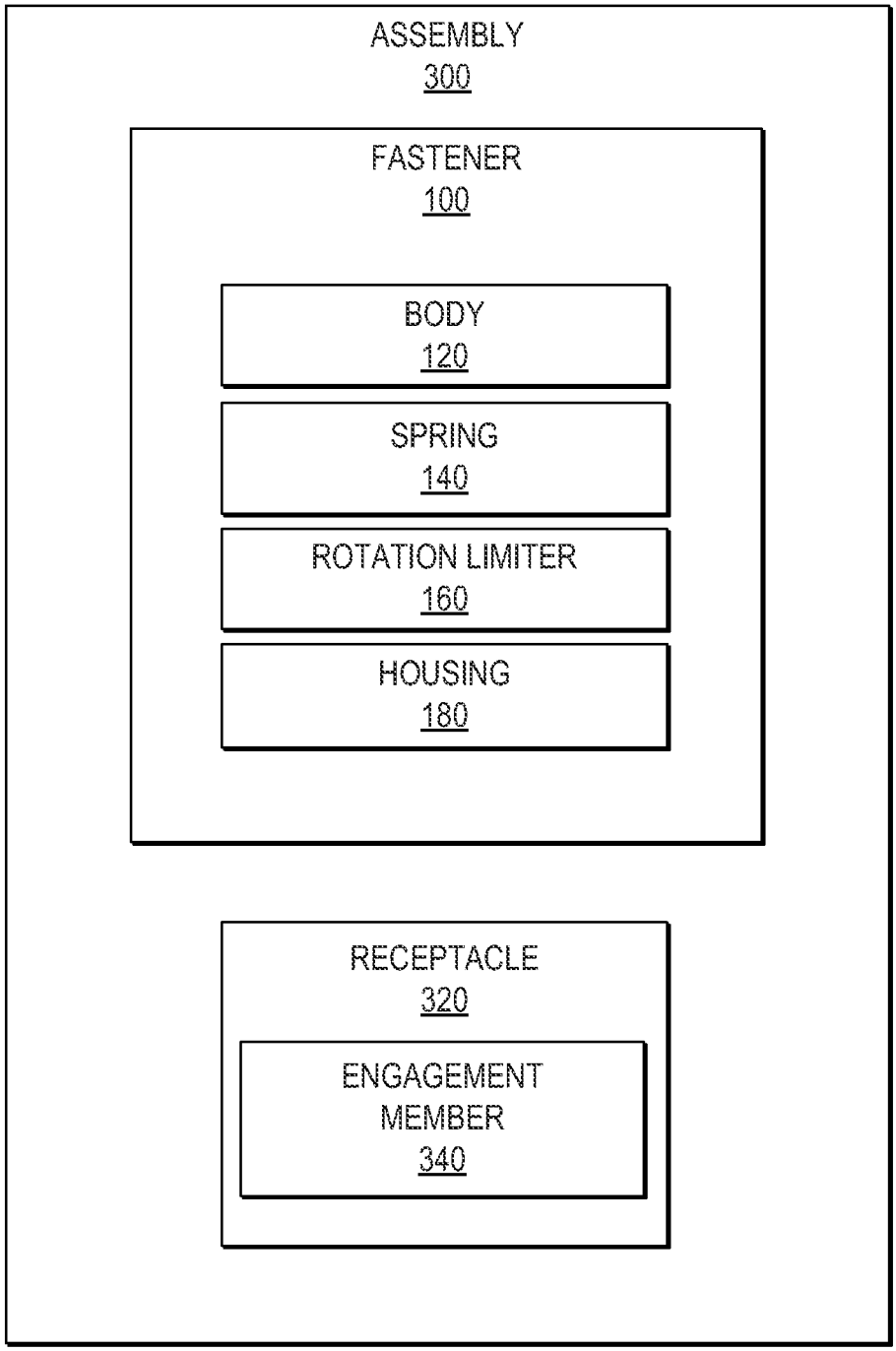

ASSEMBLY
300
FASTENER
100
BODY
120
SPRING
140
ROTATION LIMITER
160
HOUSING
180
RECEPTACLE
320
ENGAGEMENT MEMBER
340

Fig. 3

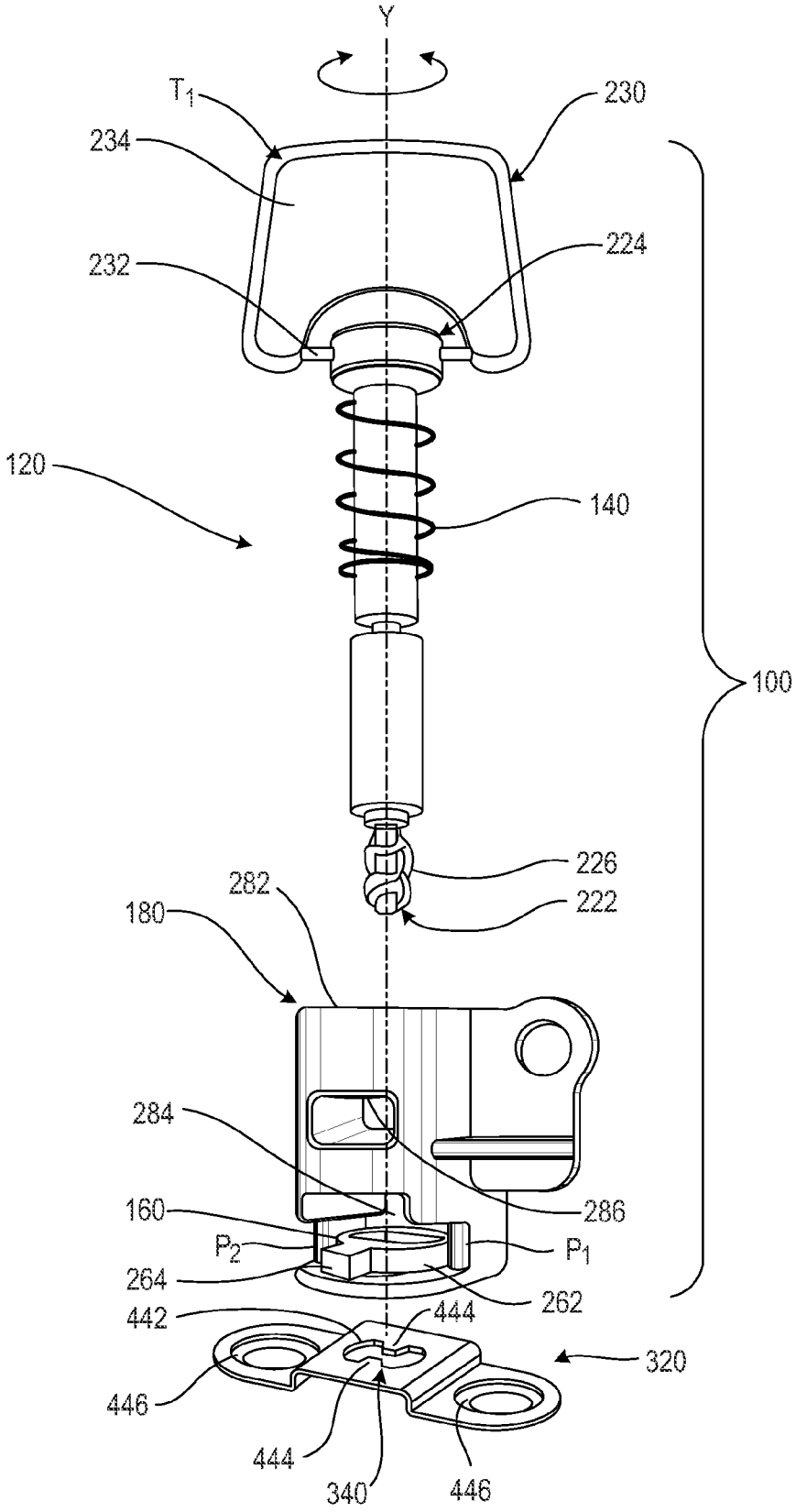

300
Y
T1
230
234
224
232
120
140
100
226
222
282
180
284
286
160
P2
P1
264
262
442
444
320
446
444
340
446

Fig. 4

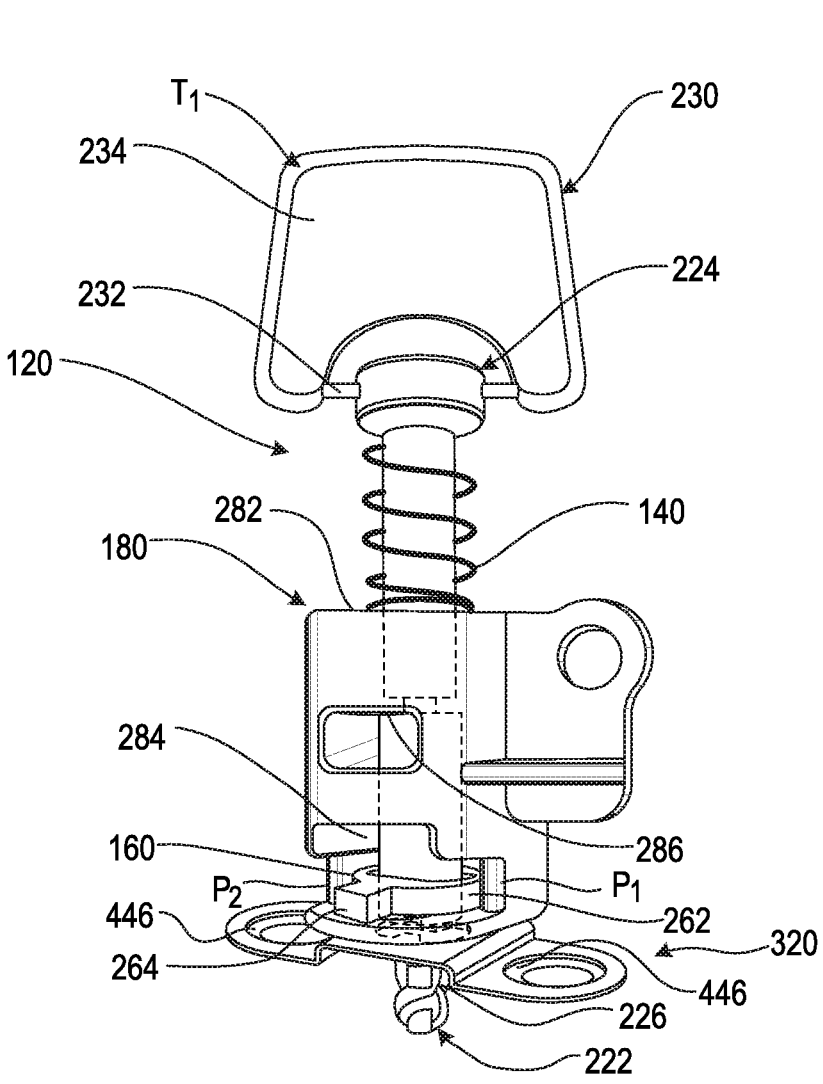

300
T1
230
234
224
232
120
282
140
180
284
286
160
P2
P1
446
262
320
264
446
226
222

Fig. 4A

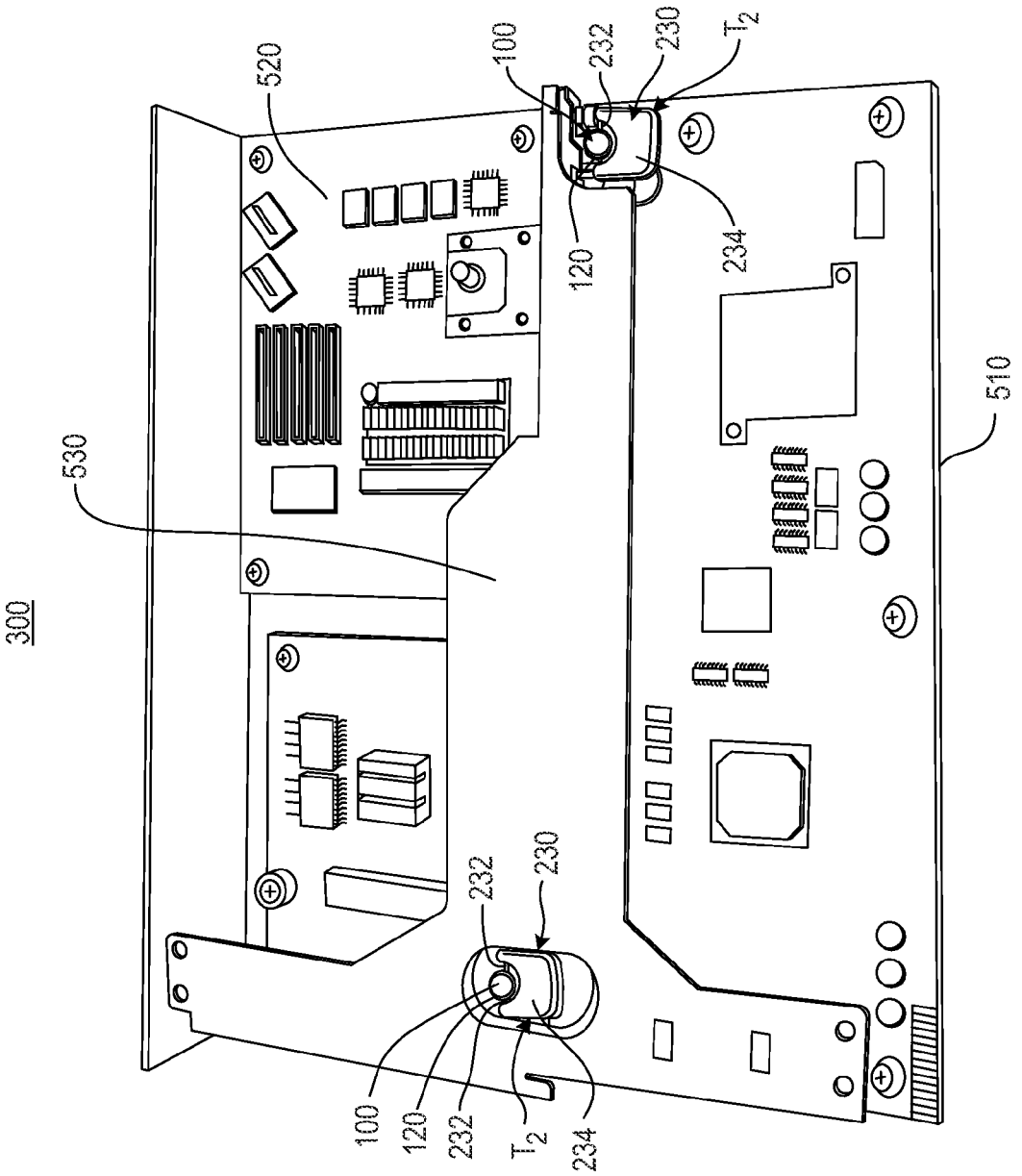


Fig. 5

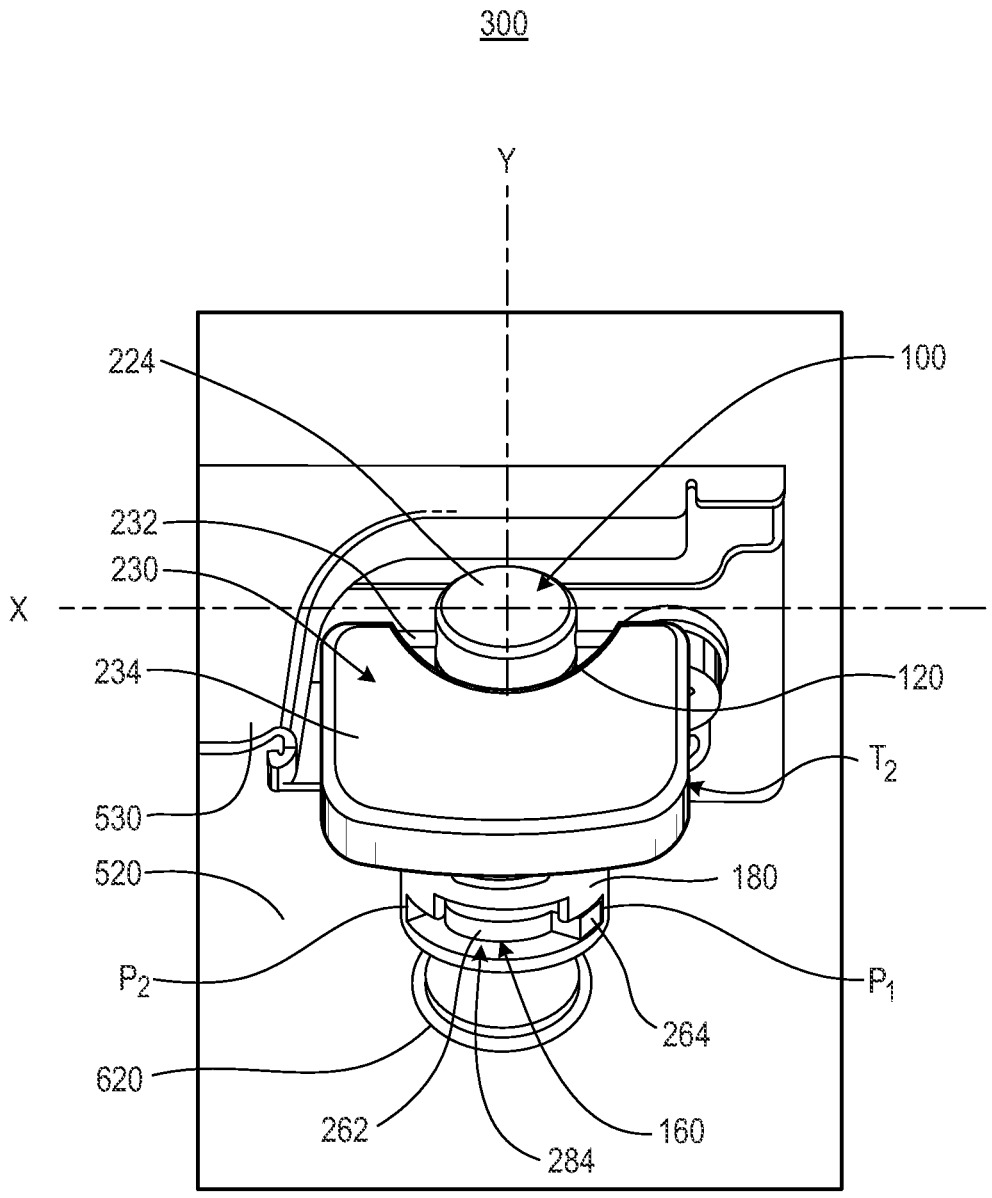

300
Y
X
224
100
232
230
234
120
T_2
530
520
180
P_2
P_1
264
620
262
160
284

Fig. 6A

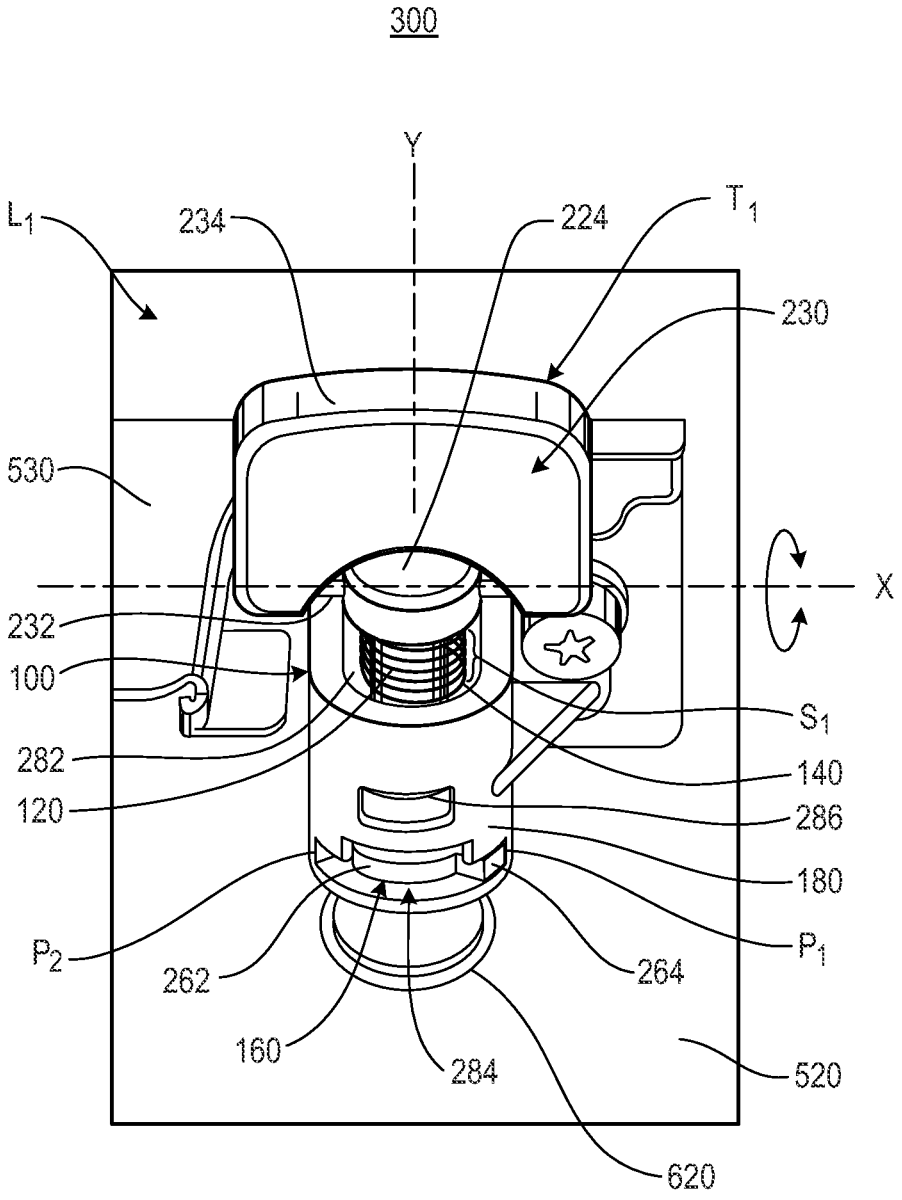

300
Y
L_1
234
224
T_1
230
530
X
232
100
S_1
282
140
120
286
180
P_2
262
264
P_1
160
284
520
620

Fig. 6B

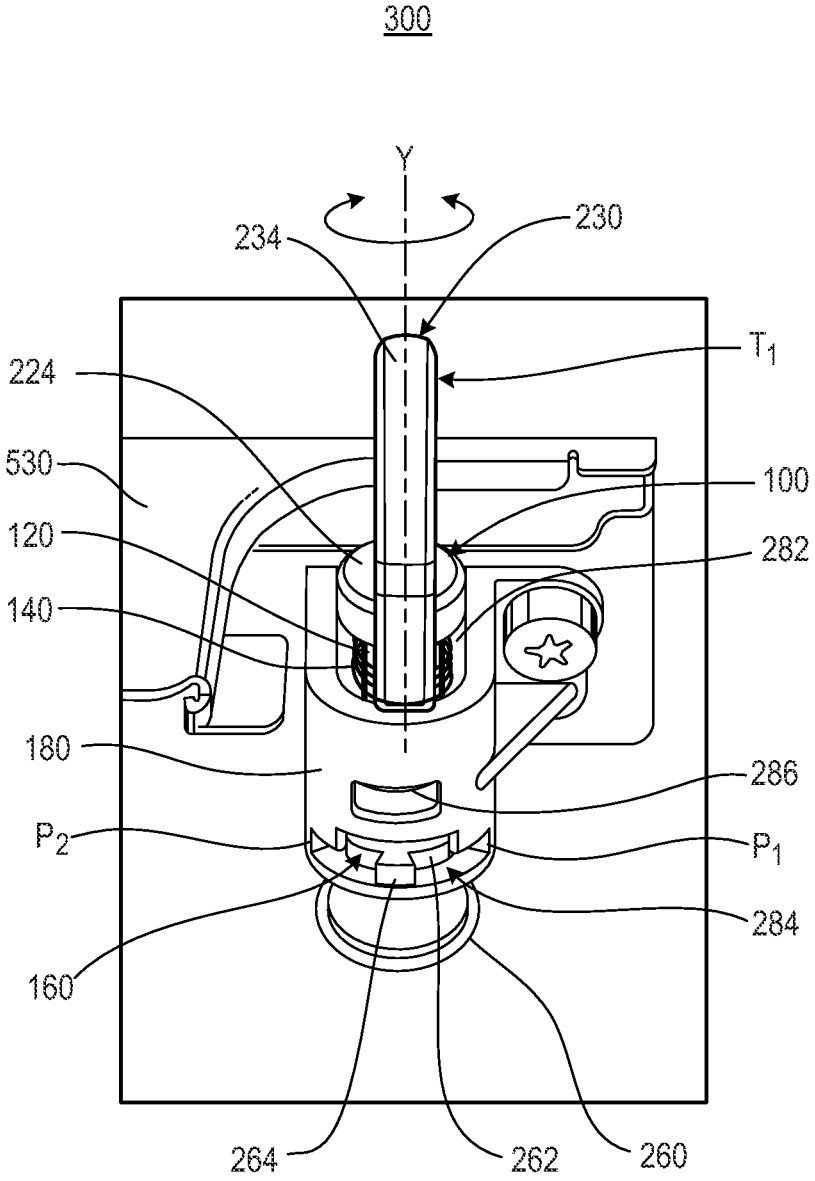

300
Y
234
230
224
T_1
530
100
120
282
140
180
286
P_2
P_1
284
160
264
262
260

Fig. 6C

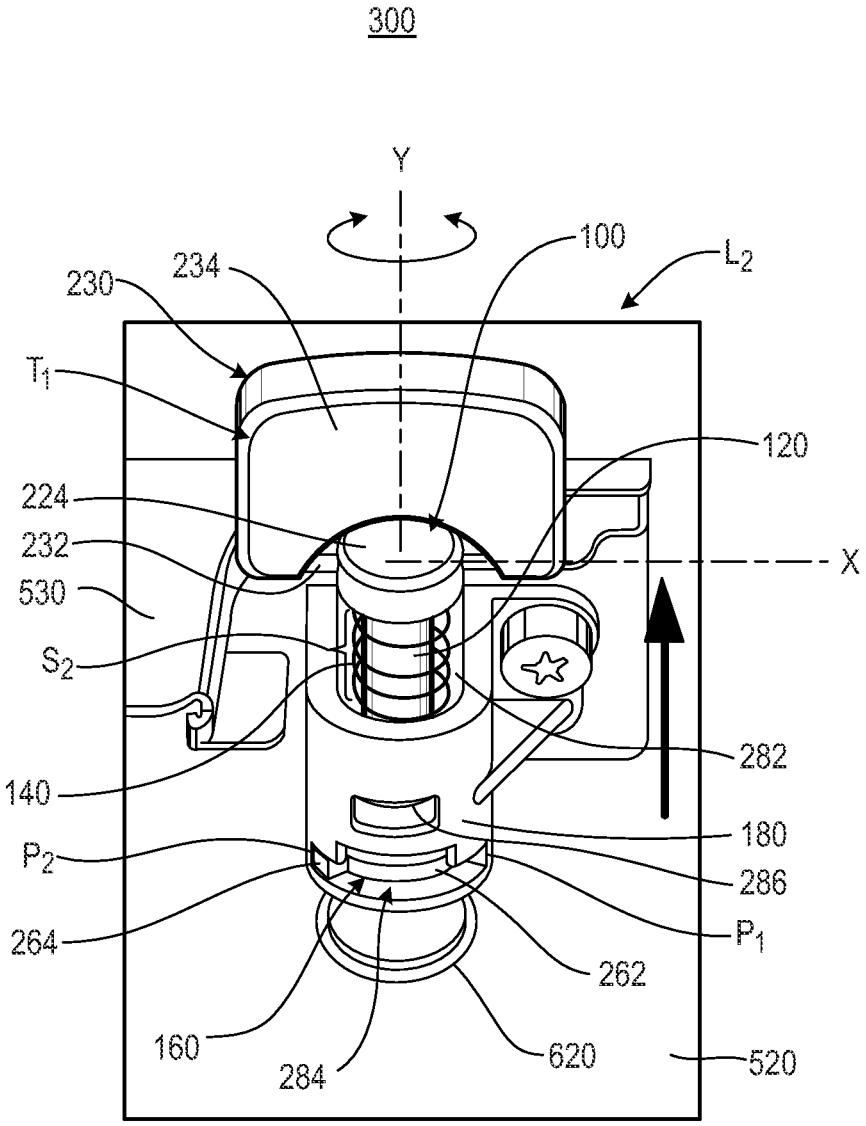

300
Y
100
L_2
230
234
T_1
120
224
232
X
530
S_2
282
140
180
P_2
286
P_1
264
262
160
284
620
520

Fig. 6D

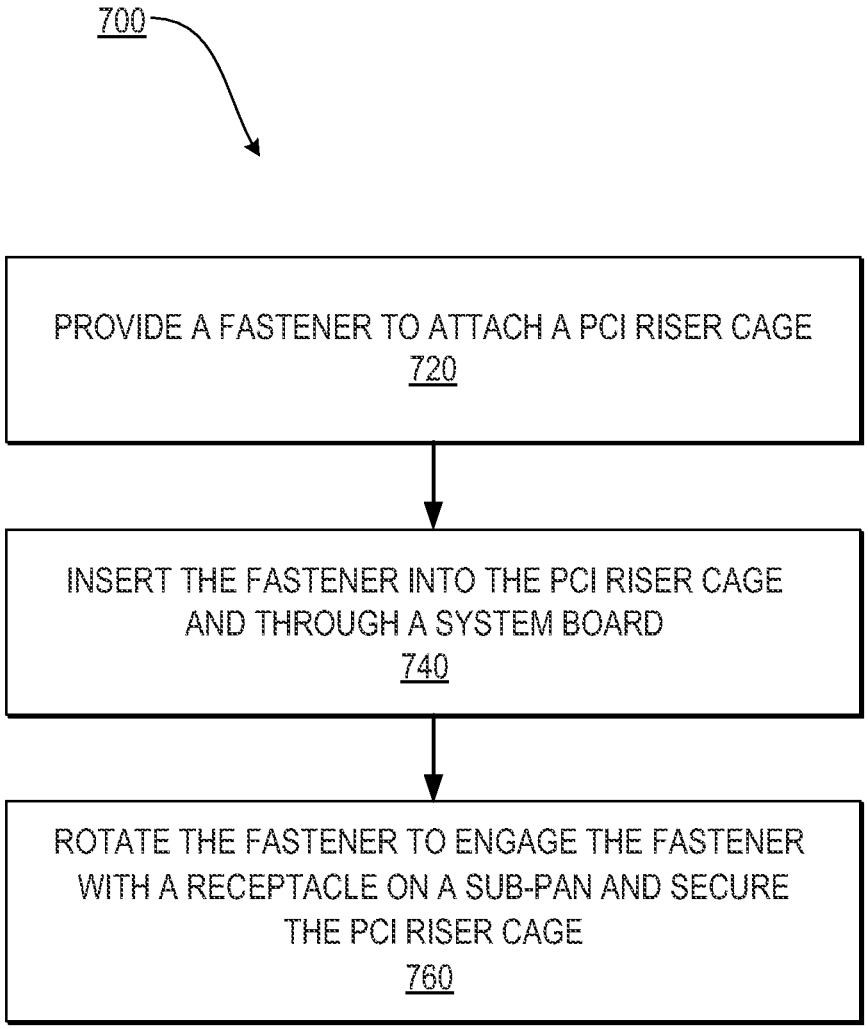

700
PROVIDE A FASTENER TO ATTACH A PCI RISER CAGE
720
INSERT THE FASTENER INTO THE PCI RISER CAGE AND THROUGH A SYSTEM BOARD
740
ROTATE THE FASTENER TO ENGAGE THE FASTENER WITH A RECEPTACLE ON A SUB-PAN AND SECURE THE PCI RISER CAGE
760

Fig. 7

PERIPHERAL COMPONENT INTERCONNECT RISER CAGE FASTENER

BACKGROUND

A peripheral component interconnect (PCI) riser cage holds PCI cards, such as graphics, audio, and storage cards. The PCI riser cage is connected to a server chassis. The PCI riser cage is secured to the server chassis using fasteners.

BRIEF DESCRIPTION OF THE DRAWINGS

Non-limiting examples of the present disclosure are described in the following description, read with reference to the figures attached hereto and do not limit the scope of the claims. In the figures, identical and similar structures, elements or parts thereof that appear in more than one figure are generally labeled with the same or similar references in the figures in which they appear. Dimensions of components and features illustrated in the figures are chosen primarily for convenience and clarity of presentation and are not necessarily to scale. Referring to the attached figures:

FIG. **1** illustrates a block diagram of a fastener useable with a PCI riser cage according to an example;

FIG. **2** illustrates the fastener of FIG. **1** according to an example;

FIG. **3** illustrates a block diagram of an assembly useable with a PCI riser cage according to an example;

FIGS. **4**, **4**A and **5** illustrate the assembly of FIG. **3** according to examples;

FIGS. **6**A-**6**D illustrate an example of the operation of the fastener of FIG. **3** at various positions; and

FIG. **7** illustrates a flow chart of a method to secure a PCI riser cage according to an example.

DETAILED DESCRIPTION

In the following detailed description, reference is made to the accompanying drawings which form a part hereof, and in which is depicted by way of illustration specific examples in which the present disclosure may be practiced. It is to be understood that other examples may be utilized and structural or logical changes may be made without departing from the scope of the present disclosure.

A peripheral component interconnect (PCI) riser cage is secured to the server chassis using fasteners. The fasteners typically include a fastener head that requires a tool to access and tighten the fastener. Oftentimes, use of tools to tighten the fastener is difficult, since the space to access the fastener is limited. Moreover, the use of additional tools takes additional time and may even require a user to read instructions and position the tool in a specific position thereon.

In examples, a fastener useable with a peripheral component interconnect (PCI) riser cage is provided. The fastener includes a body, a rotation limiter, and a housing. The body includes an engagement end that engages with a receptacle on a sub-pan and a cap end that positions the body. The rotation limiter includes a receiving member and a positioning member. The receiving member couples with the body. The positioning member extends from the rotation limiter to limit rotation of the body coupled thereto. The housing receives the rotation limiter and the body. The housing includes a rotation aperture that receives a positioning member such that the rotation limiter is rotatable along the rotation aperture. The housing further includes a lateral aperture to receive the body such that the body is inserted through the lateral aperture and coupled to the rotation limiter. The fastener provided herein secures the PCI riser cage by limiting rotation of the fastener and does not require the use of tools.

FIG. **1** illustrates a block diagram of a fastener **100** useable with a peripheral component interconnect (PCI) riser cage according to an example. The fastener **100** includes a body **120**, a spring **140**, a rotation limiter **160**, and a housing **180**. The body **120** includes an engagement end and a cap end. The engagement end engages with a receptacle on a sub-pan. The cap end positions the body **120**. The spring **140** is connected to the body **120** between the engagement end and the cap end and positions the body **120**.

The rotation limiter **160** includes a receiving member and a positioning member. The receiving member couples with the body **120**. Once coupled, the body **120** and the rotation limiter **160** move together as a unitary member. The positioning member extends from the receiving member and is received by the housing **180** to limit rotation of the body **120** coupled thereto.

The housing **180** receives the rotation limiter **160** and the body **120**. The housing **180** includes a rotation aperture and a lateral aperture. The rotation aperture extends longitudinally therein and receives the positioning member such that the rotation limiter **160** is rotatable along the rotation aperture. The lateral aperture extends laterally therethrough and receives the body **120** such that the body **120** is inserted through the lateral aperture and coupled to the receiving member of the rotation limiter **160**.

FIG. **2** illustrates the fastener **100** of FIG. **1** according to an example. The fastener **100** as illustrated includes the body **120**, a spring **140**, a rotation limiter **160**, and a housing **180**. The body **120** extends through a system board and connects to a receptacle on a sub-pan. The body **120** includes an engagement end **222** and a cap end **224**. The engagement end **222** engages with the receptacle on a sub-pan. The engagement end **222** comprises a threaded member **226** that engages with the receptacle.

The cap end **224** positions the body **120** using, for example, a cap **230** attached thereto. For example, the cap **230** includes a wire **232** extending from the cap end **224** and a tab **234** attached to the wire **232**. The tab **234** rotates around the wire **232**. The rotation of the tab **234** is illustrated as movement around an X axis between an active and an inactive state. In the active state, the tab **234** extends longitudinally from the body **120** and is utilized to rotate the body **120** and fasten to a PCI riser card to a system board. In the inactive state, the tab **234** is rotated to extend laterally from the body **120**. For example, the tab **234** may extend perpendicular from the body **120** and lie flush with the cap end **224** of the body **120** to avoid interfering with the assembly.

The spring **140** connects to the body **120** between the engagement end **222** and the cap end **224**. The spring **140** positions the body **120** longitudinally therein. The spring **140** is moveable between a compressed position and expanded position, as illustrated in FIGS. **6**A-**6**D below.

The rotation limiter **160** is received by the housing **180** and limits the rotation of the fastener **100** between a first point, P**1**, and a second point, P**2**, on the housing **180**. The first point, P**1**, and the second point, P**2**, are, for example, one hundred and eighty degrees apart. The rotation limiter **160** includes a receiving member **262** and a positioning member **264**. The receiving member **262** couples with the body **120** and holds the body **120** and the rotation limiter **160** together. Once coupled, the body **120** and the rotation limiter **160** move together as a unitary member. For example, the rotation limiter **160** is illustrated with the receiving member **262** having a double D shape, i.e., two straight edges illustrated as edges A-B and two rounded edges illustrated as edges C-D, that

receive and engage with the body **120**. The double D shape enables rotation of the body **120** and the rotation limiter **160** as a single or unitary member. The positioning member **264** extends from the rotation limiter **160** and limits rotation of the body **120** coupled thereto.

The housing **180** receives the rotation limiter **160** and the body **120**. The housing **180** includes a rotation aperture **284** and a lateral aperture **282**. The rotation aperture **284** extends longitudinally therein and receives the rotation limiter **160** such that the positioning member **264** is rotatable along the rotation aperture **284**. The lateral aperture **282** extends laterally therethrough and receives the body **120** such that the body **120** is insertable through the lateral aperture **282** and couples to the receiving member **262** of the rotation limiter **160**. After the body **120** is inserted into the housing **180** and through the rotation limiter **160**, the engagement of the body **120** and the receiving member **262** and the positioning member **264** and the rotation aperture limits rotation of the rotation limiter **160** and the body **120** thereabout.

The housing **180** may further include a biasing member **286** that engages with the spring **140** and positions the body **120**. For example, the biasing member **286** may be a lip or ledge in the housing **180** that causes the spring **140** to compress as the body **120** is rotated and engages with the receptacle. For example, the receptacle includes a receiving aperture with an engagement member extending therefrom. The engagement between the body **120** and the engagement member secures the fastener **100** therein.

FIG. **3** illustrates a block diagram of an assembly **300** useable with a PCI riser cage according to an example. The assembly **300** includes a fastener **100** and a receptacle **320**. The fastener **100** includes a body **120**, a spring **140**, a rotation limiter **160**, and a housing **180**. The body **120** includes an engagement end **222** and a cap end **224**. The engagement end **222** engages with a receptacle **320** on a sub-pan. The cap end **224** positions the body **120**. The spring **140** connects to the body **120** between the engagement end **222** and the cap end **224** and positions the body **120** longitudinally therein.

The rotation limiter **160** includes a receiving member **262** and a positioning member **264**. The receiving member **262** couples with the body **120** and holds the body **120**. Once coupled, the body **120** and the rotation limiter **160** move together as a unitary member. The positioning member **264** extends from the rotation limiter **160** and is received by the housing **180**, which limits rotation of the body **120** coupled thereto.

The housing **180** receives the rotation limiter **160** and the body **120**. The housing **180** includes a rotation aperture **284** and a lateral aperture **282**. The rotation aperture **284** extends longitudinally therein and receives the rotation limiter **160** such that the positioning member **264** is rotatable along the rotation aperture **284**. For example, the rotation limiter **160** slides into the rotation aperture **284** with the positioning member **264** extending into or along the rotation aperture **284**. The lateral aperture **282** extends laterally therethrough and receives the body **120** such that the body **120** is insertable through the lateral aperture **282** and couples to the receiving member **262** of the rotation limiter **160**. The body **120** holds the rotation limiter **16** therein.

The receptacle **320** receives the fastener **100**. The receptacle **320** includes an engagement member **340** that engages with the engagement end **222** of the body **120** and secures the body **120** thereto.

FIGS. **4-6** illustrate the assembly of FIG. **3** according to examples. The assembly includes a fastener **100** and a receptacle **320**.

The fastener **100** includes body **120**, a spring **140**, a rotation limiter **160**, and a housing **180**. The body **120** includes an engagement end **222** and a cap end **224**. The engagement end **222** engages with a receptacle **320** on a sub-pan. For example, the engagement end **222** includes a threaded member **226** that engages with the engagement member **340** of the receptacle **320**. The cap end **224** positions the body **120** using, for example, a cap **230** attached to the cap end **224** of the body **120**. For example, the cap **230** includes a wire **232** extending from the cap end **224** and a tab **234** attached to the wire **232**. The tab **234** rotates around the wire **232**. The rotation of the tab **234** is illustrated as movement around an X axis between an active state, T**1**, and an inactive state, T**2**. For example, FIG. **4** illustrates the tab **234** in the active state, T**1**, and FIG. **5** illustrates the tab **234** in the inactive state, T**2**. Referring to FIG. **4**, in the active state, T**1**, the tab **234** extends longitudinally from the body **120** and is utilized to rotate the body **120** and fasten a PCI riser card to a system board. Referring to FIG. **5**, in the inactive state, T**2**, the tab **234** is rotated to extend laterally from the body **120**. For example, the tab **234** may lie flush with the cap end **224** of the body **120** to avoid interfering with the assembly.

The spring **140** connects to the body **120** between the engagement end **222** and the cap end **224** and positions the body **120** longitudinally therein. The spring **140** is moveable between a compressed position and expanded position, as illustrated in FIGS. **6**A-**6**D below.

The rotation limiter **160** is received by the housing **180**, which limits the rotation of the fastener **100** on the housing **180**. For example, the rotation may be limited between a first point, P**1**, and a second point, P**2**, that are one hundred and eighty degrees apart. The rotation limiter **160** includes a receiving member **262** and a positioning member **264**. The receiving member **262** couples with the body **120** and holds the body **120** and the rotation limiter **160** together. Once coupled, the body **120** and the rotation limiter **160** move together as a unitary member. For example, the rotation limiter **160** is illustrated with the receiving member **262** having a double D shape to engage with the body **120**. The double D shape enables rotation of the body **120** and the rotation limiter **160** as a single or unitary member. The positioning member **264** extends from the rotation limiter **160** to limit rotation of the body **120** coupled thereto.

As shown by FIG. **4**A, the housing **180** receives the rotation limiter **160** and the body **120**. The housing **180** includes a rotation aperture **284** and a lateral aperture **282**. The rotation aperture **284** extends longitudinally therein and receives the rotation limiter **160** such that the positioning member **264** is rotatable along the rotation aperture **284**. The lateral aperture **282** extends laterally therethrough and receives the body **120** such that the body **120** is inserted through the lateral aperture **282** and coupled to the receiving member **262** of the rotation limiter **160**. After the body **120** is inserted into the housing **180** and through the rotation limiter **160**, the engagement of the body **120** and the receiving member **262** and the positioning member **264** and the rotation aperture **284** limits rotation of the rotation limiter **160** and the body **120** thereabout.

The housing **180** further includes a biasing member **286** to engage with the spring **140** and position the body **120**. For example, the biasing member **286** may be a lip or ledge in the housing **180** that causes the spring **140** to compress as the body **120** rotates and engages with the receptacle. The engagement between the body **120** and the engagement member **340** secures the fastener **100** thereto.

The receptacle **320** receives the fastener **100**. The receptacle **320** includes an engagement member **340** that engages with the engagement end **222** of the body **120**. For example,

the receptacle **320** includes a receiving aperture **442** with a protrusion **444** extending therefrom that forms the engagement member **340**. The engagement member **340** may further include a plurality of convex protrusions **444**, illustrated as a pair of convex protrusions extending from the receiving aperture **422** to engage with and secure the engagement end **222** of the body **120** thereto. The receptacle **320**, as illustrated in FIG. **4**, is attached to the sub-pan that receives a system board, using for example, a pair of connection members **446**.

Referring to FIG. **5**, the assembly **300** is illustrated attached to a sub-pan **510** with a system board **520** and a PCI riser cage **530** thereon. FIGS. **6**A-**6**D illustrate further details of the assembly **300** useable with the system board **520** and PCI riser cage **530** of FIG. **5**. FIGS. **5** and **6**A-**6**D illustrate the system board **520** including a board aperture **620** for the body **120** to extend through and connect to the receptacle **320** on the sub-pan **510**. The PCI riser cage **530** attaches to the system board **520** on the sub-pan **510**.

Referring to FIG. **5**, the assembly **300** includes two fasteners **100** attaching the PCI riser cage **530** to the sub-pan **410** with the system board **520** attached. The fasteners **100** are illustrated with the tabs **234** in the inactive state, T**2**, with the tabs **234** approximately level or flush with the PCI riser cage **530** and the cap end **224** of the body **120**. In this position, the tabs **234** do not interfere with the functioning or positioning of the PCI riser cage **530** or system board **520**.

Referring to FIGS. **6**A-**6**D an example of the operation of the fastener **100** at various positions is illustrated. The fastener **100** is illustrated to include the body **120** with a cap **230** attached to the body **120**. The cap **230** is attached such that the cap **230** is useable by a user to rotate the body **120** around the Y axis. The cap **230** as illustrated includes a wire **232** extending from the cap end **224** of the body **120** and a tab **234** attached thereto such that the tab **234** is movable around the wire **232**. The wire **232** is illustrated to lie along the X axis.

FIG. **6**A illustrates the tab **234** in the plane of the X axis and lies approximately level or flush to the PCI riser cage **530** in, for example, an inactive state, T**2**. In FIG. **6**B, the tab **234** is rotated around the wire **232** along the X axis and is positioned in the plane of the Y axis in, for example, an active state, T**1**.

Referring to FIGS. **6**A-**6**B, the spring **140** is compressed S**1** and the positioning member **282** is at a first point, P**1**. The spring **140** remains compressed S**1** as the threaded member **226** of the body **120** remains engaged with the receptacle **320**. When the spring **140** is compressed S**1**, the spring **140** is held on the body **120** by the cap end **224** and the biasing member **286** in the housing **180** that applies the pressure that holds the spring **140** in the compressed S**1** state.

Rotation of the body **120** between the positions illustrated in FIGS. **6**A-**6**D, moves the fastener **100** between a locked state, L**1**, and an unlocked state, L**2**. In the locked state, L**1**, illustrated in FIGS. **6**A-**6**B, the engagement end **222** engages with the engagement member **340** of the receptacle **320** and compresses S**1** the spring **140** such that the PCI riser cage **530** is secured to the sub-pan **510**. In the unlocked state, L**2**, illustrated in FIG. **6**D, the spring **140** expands S**2** and the engagement end **222** releases from engagement with the engagement member **340** of the receptacle **320**. The fastener **100** may similarly move from the unlocked state, L**2**, to the locked state, L**1**, by moving in reverse order from FIG. **6**D through **6**A.

For example, the body **120** is rotated one hundred and eighty degrees between FIGS. **6**B-**6**D using the tab **234** to rotate the body **120** coupled to the rotation limiter **160**. In FIG. **6**B, the fastener **100** begins at the first point, P**1**, with the body **120** rotated zero degrees. FIG. **6**C illustrates the fastener **100** rotated ninety degrees, and FIG. **6**D illustrates the fastener rotated another ninety degrees, such that the positioning member **282** reaches the second point, P**2**. The rotation of the body **120** one hundred eighty degrees, between points P**1** and P**2**, releases the threaded member **226** from the receptacle **320**. As the threaded member **226** releases from the receptacle **320**, the spring **140** expands S**2**. The expansion of the spring **140** causes the threaded member **226** of the engagement end **222** of the body **120** to come out of connection with or release from the receptacle **320**. Moreover, the spring **140** expands S**2** since the cap end **224** and the biasing member **286** are not applying pressure to keep the spring **140** compressed S**1**.

FIG. **7** illustrates a flow chart **700** of a method to secure a PCI riser cage according to an example. In block **720**, the method provides the fastener to attach the PCI riser cage to a sub-pan. The fastener includes a body, a rotation limiter, and a housing. The body includes an engagement end that engages with a receptacle on a sub-pan and a cap end to position the body. The rotation limiter includes a receiving member that couples with the body and a positioning member extending from the rotation limiter to limit rotation of the body coupled thereto. The housing receives the rotation limiter and the body. The housing includes a rotation aperture and a lateral aperture. The rotation aperture extends longitudinally therein and receives the positioning member such that the rotation limiter is rotatable along the rotation aperture. The lateral aperture extends laterally therethrough and receives the body such that the body is inserted through the lateral aperture and coupled to the receiving member of the rotation limiter.

The fastener is inserted into the PCI riser cage and through a system board, in block **740**. The PCI riser cage and the system board each include at least one aperture aligned to receive the fastener. In block **760**, the fastener is rotated and engages the fastener with a receptacle on a sub-pan and secures the PCI riser cage thereon. Rotation of the fastener includes, for example, limiting rotation of the fastener, such as limiting rotation to at most one hundred eighty degrees between a first point and second point. The rotation may be performed by a user and aided through the use of a cap that rotates the body, and engages the engagement end of the fastener with an engagement member on the receptacle. The cap may include, for example, a tab and a wire that enables the tab to move between an active and an inactive state, such that the tab lies approximately level or flush with the PCI riser cage when the tab is not in use. The tab is also rotatable such that the tab extends from the body of the fastener and is useable to rotate the fastener around the Y axis, as illustrated in FIGS. **2**, **4**, and **6**A-**6**D above.

The receptacle includes an engagement member that the engagement end engages with. The engagement member may include a receiving aperture with a plurality of convex protrusions that engage with the engagement end of the fastener. As the engagement end engages with the receptacle, a spring on the body may be compressed by a biasing member in the housing to hold the PCI riser cage and reduce movement of the PCI riser cage fastened thereto. Similarly, as the engagement end releases from the receptacle, the spring expands and moves the threaded member out of engagement with the engagement member.

The present disclosure has been described using non-limiting detailed descriptions of examples thereof and is not intended to limit the scope of the present disclosure. It should be understood that features and/or operations described with respect to one example may be used with other examples and that not all examples of the present disclosure have all of the features and/or operations illustrated in a particular figure or described with respect to one of the examples. Variations of

examples described will occur to persons of the art. Furthermore, the terms "comprise," "include," "have" and their conjugates, shall mean, when used in the present disclosure and/or claims, "including but not necessarily limited to."

It is noted that some of the above described examples may include structure, acts or details of structures and acts that may not be essential to the present disclosure and are intended to be exemplary. Structure and acts described herein are replaceable by equivalents, which perform the same function, even if the structure or acts are different, as known in the art. Therefore, the scope of the present disclosure is limited only by the elements and limitations as used in the claims.

What is claimed is:

1. A fastener useable with a peripheral component interconnect (PCI) riser cage, the fastener comprising:

a body with an engagement end and a cap end, the engagement end to engage with a receptacle on a sub-pan, the cap end to position the body;

a spring connected to the body between the engagement end and the cap end to position the body;

a rotation limiter including a receiving member with a double D shape to couple with the body, such that the body and the rotation limiter move together as a unitary member, and a positioning member extending from the rotation limiter to limit rotation of the body coupled thereto; and

a housing to receive the rotation limiter and the body, the housing includes a rotation aperture and a lateral aperture,

the rotation aperture extending longitudinally therein to receive the positioning member such that the rotation limiter is rotatable along the rotation aperture,

the lateral aperture extending laterally therethrough to receive the body such that the body is inserted through the lateral aperture, positioned by the spring, and coupled to the receiving member of the rotation limiter.

2. The fastener of claim **1**, wherein the body extends through a system board and connects to a receptacle on a sub-pan.

3. The fastener of claim **2**, wherein the engagement end comprises a threaded member to engage with the receptacle.

4. The fastener of claim **1**, further comprising a cap attached to the cap end of the body to position the body.

5. The fastener of claim **4**, wherein the cap comprises a wire extending from the cap end of the body and a tab attached thereto.

6. The fastener of claim **1**, wherein the rotation limiter enables rotation of the fastener between a first point and a second point.

7. The fastener of claim **6**, wherein the first point and the second point are one hundred and eighty degrees apart.

8. The fastener of claim **1**, wherein the housing further comprises a biasing member, the biasing member includes a lip in the housing that causes the spring to compress as the body is rotated and engages with the receptacle.

9. An assembly usable with a peripheral component interconnect (PCI) riser cage, the assembly comprising:

a fastener including:

a body with an engagement end and a cap end, the engagement end to engage with a receptacle on a sub-pan, the cap end to position the body,

a spring connected to the body between the engagement end and the cap end to position the body,

a rotation limiter including a receiving member with a double D shape to couple with a portion of the body to hold the body and the rotation limiter together, and a positioning member to couple with the engagement end of the body, the positioning member extending from the rotation limiter to limit rotation of the body coupled thereto; and

a housing includes a rotation aperture and a lateral aperture that receives the rotation limiter and the body,

the rotation aperture extending longitudinally therein to receive the positioning member such that the rotation limiter is rotatable along the rotation aperture,

the lateral aperture extending laterally therethrough to receive the body such that the body is inserted through the lateral aperture, positioned using the spring, and coupled to the receiving member of the rotation limiter; and

a receptacle to receive the fastener, the receptacle including an engagement member to engage with the engagement end of the body.

10. The assembly of claim **9**, wherein the receptacle comprises a receiving aperture with the engagement member extending therefrom to engage with and secure the engagement end of the body thereto.

11. The assembly of claim **10**, wherein the engagement end comprises a threaded member to engage with the engagement member of the receptacle.

12. The assembly of claim **9**, wherein the receptacle is attached to the sub-pan.

13. The assembly of claim **9**, wherein the PCI riser cage attaches to a system board on the sub-pan.

14. The assembly of claim **9**, further comprising a system board, the system board including a board aperture for the body to extend through and connect to the receptacle.

15. The assembly of claim **9**, further comprising a cap attached to the body to enable rotation of the body.

16. The assembly of claim **9**, wherein the housing further comprises a biasing member to engage with the spring and position the body.

17. The assembly of claim **9**, wherein the rotation limiter and the housing permit rotation of the body one hundred and eighty degrees.

18. The assembly of claim **9**, wherein rotation of the body moves the fastener between a locked state and an unlocked state,

in the locked state the engagement end engages with the engagement member and compresses the spring such that the PCI riser cage is secured to the sub-pan, and

in the unlocked state, the spring expands and the engagement end releases from engagement with the engagement member.

19. A method to secure a peripheral component interconnect (PCI) riser cage, the method comprising:

providing the fastener to attach the PCI riser cage, the fastener including fastener including:

a body with an engagement end and a cap end, the engagement end to engage with a receptacle on a sub-pan, the cap end to position the body;

a rotation limiter including a receiving member with a double D shape to couple with a portion of the body and to move with the body as a unitary member, and a positioning member extending from the rotation limiter to limit rotation of the body coupled thereto; and

a housing to receive the rotation limiter and the body, the housing includes a rotation aperture and a lateral aperture,

the rotation aperture extending longitudinally therein to receive the positioning member such that the rotation limiter is rotatable along the rotation aperture,

the lateral aperture extending laterally therethrough to receive the body such that the body is inserted through the lateral aperture and coupled to the receiving member of the rotation limiter;

inserting the fastener into the PCI riser cage and through a system board; and

rotating the fastener to engage the fastener with a receptacle on a sub-pan and secure the PCI riser cage thereon.

20. The method of claim **19**, wherein rotating the fastener further comprises limiting rotation of the fastener degrees to engage the engagement end with an engagement member on the receptacle.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 9,098,252 B2
APPLICATION NO. : 13/529257
DATED : August 4, 2015
INVENTOR(S) : Keith A. Sauer et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims:

In column 8, line 56 approx., in Claim 19, delete "fastener including fastener including:" and insert -- fastener including: --, therefor.

In column 9, line 14, in Claim 20, delete "fastener degrees to" and insert -- fastener to --, therefor.

Signed and Sealed this
Twenty-third Day of August, 2016

Michelle K. Lee

Michelle K. Lee
Director of the United States Patent and Trademark Office